The Future Development of the WHEAT GROWING INDUSTRY in AUSTRALIA

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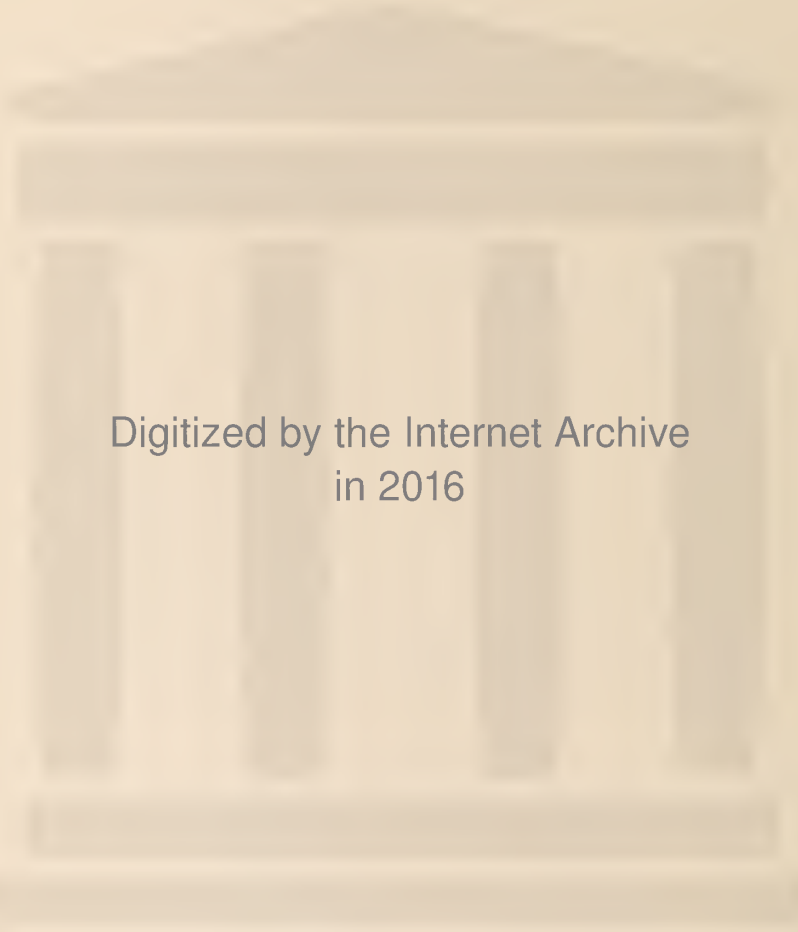

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By A. H. E. McDONALD
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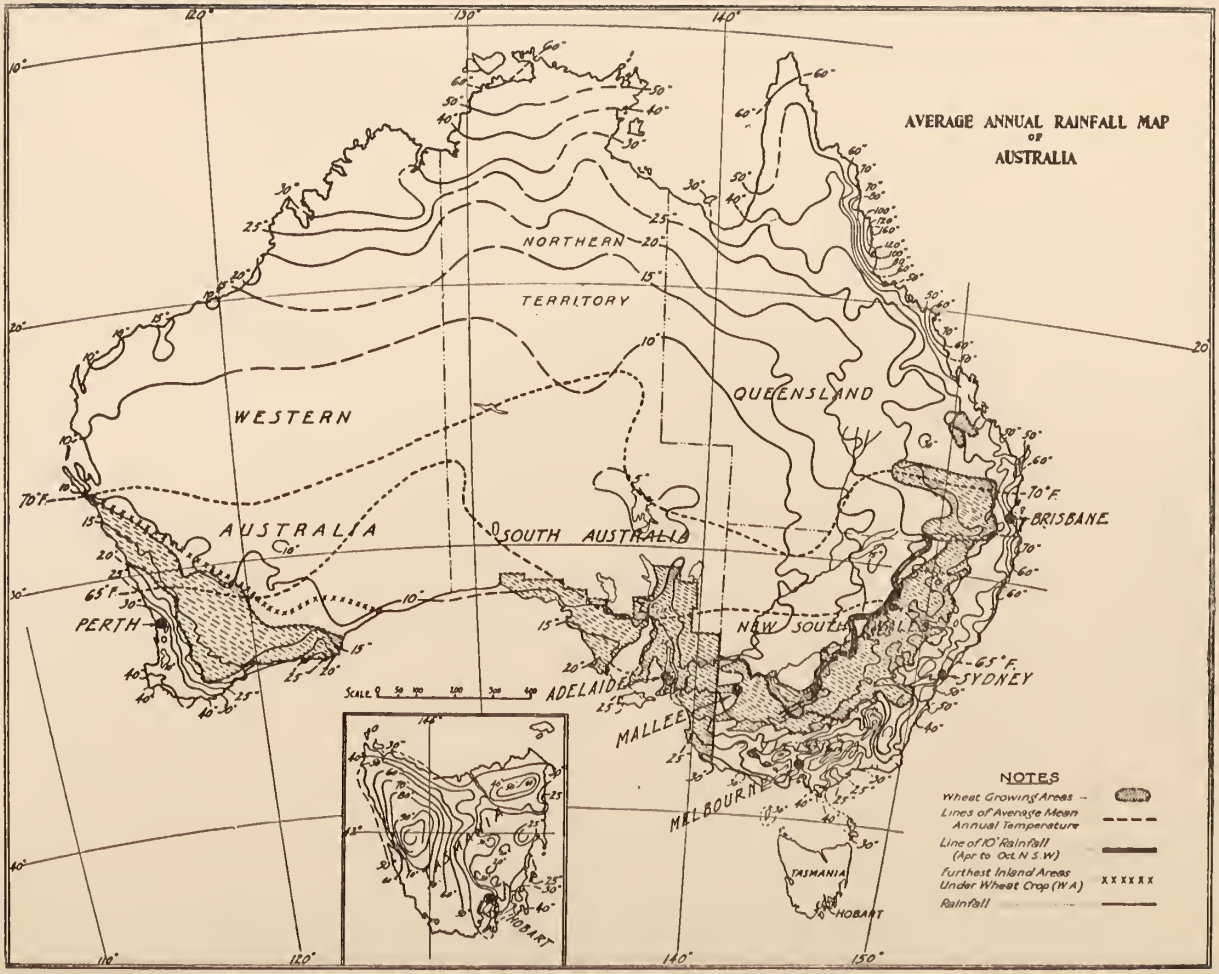

WHEAT AND RAINFALL MAP OF AUSTRALIA

(Courtesy of Commonwealth of Australia Bureau of Meteorology, Melbourne)

HISTORY OF WHEAT GROWING

When Captain Phillip established the first settlement at Port Jackson early in 1788, he immediately set about the preparation of land for the production of wheat and in his despatch of May, 1788, he stated he proposed to sow eight acres with wheat and barley. The land in the immediate vicinity of Port Jackson, however, is very poor and the climate, owing to the humidity and warmth is unsuited to wheat, so that little success was achieved. Shortly afterwards more suitable land was found near Parramatta and although this is only twelve miles from Sydney the atmosphere is drier and attempts at cultivation were more successful, as Phillip in 1790 reported that 200 bushels of wheat had been harvested.

The area under wheat and other crops gradually increased and for a considerable time wheat was grown fairly extensively on the coastal plains lying between the coast and the mountains. The soil for the most part, however, is somewhat inferior, except the alluvial flats of the Hawkesbury Valley, and these are somewhat too rich, producing great leaf growth, but not conducing to the development of grain. The alluvial lands were found more suitable for the growth of maize, potatoes, pumpkins and other vegetables and the growing of wheat was discontinued. Periodic outbreaks of rust discouraged growers generally, and for many years wheat has not been grown for grain on the coastal areas of New South Wales.

In the meantime a passage over the mountains had been discovered and more suitable lands were opened up for settlement. It was found to be excellent grazing country and its suitability for live stock, particularly merino sheep, led to the rapid development of the live stock industry and had a very important influence upon the agricultural development of New South Wales for many years. It created a popular bias in the favor of pastoral industries and this has persisted until quite recent years.

The mountain barrier, cutting off the western arable land from the centers of population on the coast, also had some influence upon agricultural development, and progress in the farming industry was slower than in the other colonies of Victoria and South Australia, which had been opened up in the meantime. In both these colonies suitable land was found near the shipping ports and this naturally encouraged men with limited capital, who could not engage in the pastoral industry which required some considerable amount of capital, to develop the agricultural industries. Wheat for bread-making, of course, was most important and became the leading crop.

The climate in these colonies, even quite close to the coast, is temperate with sufficient rain during the growing period to promote even growth of the

crop and the dry conditions later favour ripening. These conditions tended to produce a bright hard grain and a reputation was created for Australian wheat which it still retains.

The attached table gives the acreage under all crops from 1860 to 1923-24. (Appendix A.)

It will be noted from this table that Victoria, although a small colony relatively, and South Australia, also small in regard to agricultural area within a favourable rainfall area, made the most rapid progress from 1860 to 1910-11, and that the rate of progress then declined and became more marked in New South Wales. In Tasmania progress has been of a steady character throughout. In West Australia little progress was made in agriculture until 1910, but from then onwards the rate has been very rapid. Queensland experienced steady progress, but in view of the large area of the state the area under cultivation is relatively low.

In New South Wales agricultural development was retarded in the first place by the predominance of the pastoral industry, but the development of labour saving machinery and the acquisition of experience and knowledge gained in cultural methods later rendered it possible to secure returns which enabled agriculture to compete with pastoral interests for the use of the land. Also in Victoria and South Australia the earlier development of agriculture made farming land difficult to obtain and the surplus farming population sought new lands. These they found in New South Wales and Western Australia. The latter state was particularly attractive as the land had not a high value for pastoral purposes as in New South Wales and actually for the most part was Crown land, which could be acquired on very reasonable terms. This led to a large influx of settlers and a rapid extension of the sown area.

The principal factors which influence the development of the wheat growing industry are natural conditions—climate and soil—and economics.

The latter is important and embraces the effect upon the wheat industry of the general economic conditions of the country.

The price of wheat is determined principally by the markets of importing countries and it is obvious that farmers producing wheat in a country such as Australia where the policy is one of protection are affected by this policy. Wheat also comes into competition with other industries such as wool raising. The land is naturally splendidly fitted for the pasturing of sheep and its value for this purpose is enhanced by cultivation. Farmers can readily turn from wheat to sheep or vice versa and when wool is high in price there is a tendency to revert to sheep and if wool falls in price to extend the area under wheat.

In considering the general question of the possible developments of the wheat industry it is not proposed to enter fully into the effects of the economic position upon wheat growing. It is apparent, however, that it has a very material bearing. Some sort of yield can be obtained over a great area of Australia where wheat is not now grown or from land within the present

wheat belt which at present is not cultivated. The land is not used for wheat growing owing to soil or climatic conditions or a combination of both making the yields so light that it is not profitable to use the land for wheat.

If under present prices a yield of say 10 bushels per acre must be obtained to enable wheat to be profitably grown, land which will give only nine bushels cannot be used for wheat. On the other hand if prices become higher without a corresponding increase in the cost of production it is possible that it would be profitable to farm land which yielded only nine bushels per acre.

These are phases of the effects of economics which affect the position and which cannot be foretold.

In an endeavor to formulate some estimate of the wheat growing possibilities of Australia, it is proposed to ignore the effect of changes in economic conditions. The conditions of the present are accepted and an endeavour is made to estimate what extension can be expected, assuming that a genuine desire existed to place as much land as possible under wheat.

The factors which then affect the position are soil and climatic conditions. It is impossible to determine the relative importance of each. In the early history of wheat growing the crop was confined to those areas of the state favoured by a fairly copious and even rainfall. At a later period it was generally accepted that wheat could only be safely grown in areas where the rainfall during the growing period—April to October—exceeded 10.0 in.

Now it is accepted that wheat can be grown with a rainfall of 7.5 inches during the growing period within the limits of the 65°F isotherm and with 10 inches within the 70°F isotherm. Other climatic factors, however, also have an influence. In Western Australia for example wheat is actually grown outside the 65° isotherm with only 7.5 inches of rain in the growing period.

Rainfall and temperatures, however, only set a general limit on the possible wheat growing area. They give some general indication of the climatic conditions which are essential. These conditions are a temperate climate with a fairly even rainfall from April to October. With rainfall of 7.5 inches and within the 65°F isotherm, these conditions are likely to be found. It is also essential, however, that favourable rain for the germination of the seed shall be received during April and May, and also that there shall be favourable rain to develop the grain about September. The latter is of less importance, as where the land is well farmed to conserve moisture excellent yields are produced without appreciable rain at this period.

In the southern portion of the continent and practically on all the area within the 65° isotherm, the conditions are fairly stable in this respect, but within the isotherm of 70° in New South Wales and Queensland with a growing period rainfall of 10 inches, they are not stable. Within this region, the rainfall is erratic in nature, and frequently rain does not fall at the critical period and poor crops follow.

In this warmer zone there is also a more rapid change from winter to

summer and unfavourable winds frequently occur in the spring and harmfully affect the crops.

The character of the soil, particularly its physical nature, is equally as important as climatic conditions. To those having knowledge of the conditions under which wheat is grown in other countries, it must appear somewhat remarkable that wheat can be profitably grown in an area where the rainfall during the growing period is only 7.5 inches and where the total annual rainfall is about 12 inches per annum.

In actual practice it is found that wheat can only be profitably grown under such conditions when the soil is of a type that will respond to light rains.

It has been found that the suitability of soils must be considered in relation to the rainfall. This, of course, is also the case in regions where rain is reasonably plentiful, but it is emphasized in regions of low rainfall.

When the annual rainfall falls as low as 12 inches per annum none can be wasted and each drop must be made effective. It is entirely due to the special character of some types of soils within this area that payable wheat yields are obtained.

In general these soils are light loams or sandy loams of 6 inches to 12 inches in depth overlying a subsoil of clay or extremely fine loam having the water holding qualities of clay.

These soils are mostly formed by the drift action of winds and are composed of fine grains.

They are light, absorb rain easily and retain it fully owing to the fineness of the grains presenting a large surface area. The fineness also is such that the aeration is perfect and in consequence the soil does not lack air and yet there is not excessive movement of the air in the soil leading to evaporation. The fineness of the soil grains also enables plant roots to remain in intimate contact with the soil particles. A special feature is that, owing to its peculiar character, the soil does not pack hard after rain and always remains in good condition. It is not rich in plant food constituents. This adds to its value, as no excessive vegetative growth is made at any period and a healthy, hardy plant is produced which withstands dry conditions. The nature of the soil is such that evaporation of moisture can easily be prevented by the maintenance of a loose surface, but on the other hand, unlike soils of a clay nature, it parts with moisture readily to plants. On such soils light falls of 30 to 40 points of rain will ensure germination and light falls at the earing stage suffice to fill the grain.

A peculiarity of some of these soils is that they produce an extraordinary type of trees known as Mallee. These are Eucalypts varying in height from six feet to about 20 feet. A Mallee tree has no defined trunk like an ordinary tree but several stems come away from the one base and the plant has the appearance of the suckers that come from the base of some trees when they are cut down close to the ground. Below the stems immediately under the surface

of the land is a great gnarled growth from which the roots spread. This would seem to be a deformed sub-surface tree trunk.

The Mallee is confined to the type of soil described above and its limits are generally very sharply defined.

Adjoining Mallee land, soil of a light type of somewhat similar character is often found, but which because of an almost imperceptible difference supports trees of a normal character.

In low rainfall regions clay soils or soils of high fertility are unsuitable for crop production. Frequently fertility as measured by the chemical constituents is combined with the clayey physical condition. Clay soils do not absorb moisture readily and hold it tenaciously.

Light rains do not promote germination and heavier rain is needed to bring the crop to maturity. High fertility produces at times an excessive growth which the rainfall is insufficient to maintain. These soils are expensive to work and the light yields are unprofitable.

On the other hand in the Mallee country much of the soil is practically only loose deep shifting sand. Such soil is of no value for the production of crops.

It is apparent that in regions of low rainfall freedom of choice in regard to land does not exist as in regions of good rainfall. In the latter the soil condition is not so important and a wider range of varieties of soil can be successfully cultivated.

This necessarily determines the extent of land which may be regarded as suitable for crop production.

The following typical analysis of a Mallee soil and a clay loam will be of interest:

	Potash	Lime	P_2O_5	CO_2	Nitrogen
Mallee	.376	.719	.071	.178	.079
Goulburn Valley	.822	.320	.057	.057	.059

MECHANICAL ANALYSIS

	Mallee	Goulburn Valley
Fine Gravel	.694	.0750
Coarse Sand	3.367	.2150
Medium Sand	24.390	.7050
Fine Sand	21.887	1.4750
Very Fine Sand	18.790	6.7450
Silt	2.647	15.4650
Fine Silt	2.217	11.1750
Clay	18.510	50.9750

In seeking to determine the acreage which may be sown to wheat, regard must be paid to farming practice. This is determined in part by economic conditions and in part by natural conditions. The farmer cultivates the land to provide a means of livelihood for himself and family, and farming as a business must keep on fairly level terms with other means of employment.

If it cannot provide a means of livelihood the farmer cannot remain engaged in it. Changes in general economic conditions would no doubt, if in a downward direction, tend to enable a farmer to produce a living from a smaller area, while on the other hand if the trend of economic conditions is against the farmer by increasing his costs, he will seek a remedy by cultivating more land in order that he may have more to sell. This in fact has been the case and the unit size of a farm, although not definite, has increased to somewhere in the vicinity of 800 acres as compared with approximately 600 acres of a decade previously. In order to produce more the farmer has called to his aid larger and more efficient machinery and has produced more without increasing his expenses proportionately. It has the effect, however, of influencing the total area under crop as the farmer with 600 acres would probably crop 250 acres or 41.6%, whereas a farmer with 800 acres would probably crop 300 acres or approximately 37.5%. These are statements which cannot be supported by actual figures, but they indicate approximately changes that are occurring owing to economic forces.

In seeking to determine the probable ultimate area that can be annually cropped with wheat, the effect of natural conditions upon farming practice must be considered and also the competition offered by other rural industries.

In the development of new country in Australia in the areas suited to wheat the first impulse is to engage extensively in the production of this crop. The latent fertility of the soil encourages the practice; it is a crop that is easily produced and it affords a means of providing capital for the purchase of live stock.

The growing of wheat continuously or alternated with bare fallow interferes with the fertility by drawing upon chemical constituents of the soil, and the land becomes infested with weeds and plant diseases. On the other hand the cultivation of the land improves its quality for grazing. With the general changed circumstances the farmer finds it possible and in fact necessary to bring more diversity into the farming practice. He gives more attention to stock raising and reduces the proportion of land under wheat.

As the acre yields are light he must cultivate large areas and must employ cultivating and harvesting machinery which will cover the land rapidly with a minimum amount of power. In proportion to the area cultivated, the horse power is insignificant and very many farmers use tractors and employ no horses. The natural conditions make it unnecessary to stable horses and consequently no farmyard manure is available to maintain fertility. During the early years of land cultivation little concern is felt on this account, but ultimately it is recognized that action must be taken to restore fertility. The most practicable means is to allow the land to revert to pasture or to grow green crops such as oats, lucerne, etc., and to depasture these with sheep.

Experience has shown in the older settled districts that such a change is necessary to ensure payable crops of wheat and it has also been demon-

strated that the returns from fat lambs and wool make the practice a profitable one.

The increase in country population following upon the wealth produced from wheat creates a demand for other forms of produce and some land is devoted to the production of crops to meet this demand.

An important factor also is that the low rainfall renders it essential that a considerable part of the land shall be bare fallowed for twelve months before the crop is sown in order that sufficient moisture will be available to develop a payable crop. Over most of the wheat growing belt it is necessary that an area equal to that sown to wheat shall be fallowed. In districts more favoured in regard to rainfall the proportion is not so great, but amounts to at least 33%.

The natural features of the country render it inadvisable to utilise some land for wheat which is otherwise suitable. Considerable tracts of the country owing either to its hilly nature or to the physical condition of the soil, are suitable only for pasturage. Interspersed with this, however, arable land occurs, but it is more profitable to use this for the production of crops to supplement the pasturage.

An exhaustive analysis has been made by Professor Perkins, Director of Agriculture, South Australia, in regard to the suitability of land in that state for cultivation and the proportion that can in actual practice be annually utilised for the production of wheat. He estimates that approximately 15,000,000 acres are suitable for cultivation and after allowing for annual fallowing and the use of land for other production estimates that 3,950,000 acres can be sown to wheat for grain. This represents 26.33% of the total suitable area. Such a percentage may appear to be small but when consideration is given to the need for fallowing, the production of crops for stock feeding to maintain the soil fertility, to diversify farming and the land required to produce other commodities required by the population, it becomes justified.

PROBABLE ACREAGE OF WHEAT IN AUSTRALIA

At present wheat is principally grown within a belt bounded by winter rainfall lines of 15 inches on one side and 7.5 inches on the other. In West Australia a considerable area is sown within the 15-inch and 20-inch lines, but this is due in part to special soil and climatic conditions and to settlement being yet so small that other agricultural industries have not displaced wheat. In Victoria and South Australia and New South Wales very little wheat is grown within this area. In New South Wales at present little wheat is grown beyond the 10-inch winter rainfall line, but in the southern parts of the state there is a marked tendency to extend the cultivation of wheat to the 7.5-inch line.

In the early days of settlement wheat could be grown successfully only in regions where the rainfall was in the vicinity of 15 inches during the winter

months. With the acquisition of knowledge in regard to cultural methods which enabled moisture to be conserved by fallowing, the use of fertilisers which assisted in developing drought resistance, the development by breeding and selection of varieties requiring only limited amounts of moisture and the improvement of labour saving machinery, the wheat growing areas have been extended considerably into the dry areas.

Although remarkable achievements have been made and the progress has been fairly consistent it would require considerable optimism to anticipate that there will be still further extension into regions of lower rainfall. Undoubtedly twenty years ago it was never expected that wheat could be grown successfully in regions where at the present day the industry is firmly established, but the movement has been immensely assisted by the changes outlined above and similar marked changes cannot be expected in future years.

Beyond the 7.5-inch winter rain line in the southern part of the continent, there is a decrease also in the total annual rainfall and consequently not the same opportunity of conserving moisture in the fallows. The rainfall also becomes more erratic. Effective falls during the sowing and ripening period cannot be relied upon and the likelihood of crop failures is increased. The temperature and wind conditions also become more variable and increase the risk. It is found, however, that local circumstances vary and beyond the 7.5-inch line it will no doubt be found that expansion will take place, but only as a result of actual experience, and it must be anticipated that it will be limited.

In the northern part of New South Wales and in Queensland the wheat belt does not at present extend beyond the 10-inch winter rainfall line and it is unlikely that it will do so. This is owing to the erratic nature of the rainfall, the soil conditions and temperature and wind conditions. Although a very large part of New South Wales and Queensland has an average winter rainfall of 10 inches, it is very irregular in its incidence. In some years it is very heavy and in others low. When it is heavy crops may be good, but they are liable to damage through outbreaks of disease, and in the low rainfall years they fail.

The difficulty in securing crops is enhanced owing to the nature of the soil. Unlike the wheat areas of the southern portion of the continent, the soil in the north is mostly of a heavy type and is generally very fertile. Such soil requires much more rain, as it does not part with moisture so readily. The high fertility combined with winter warmth produces soft sappy stems and leaves with heavy transpiration. In the spring there is usually a rapid change from cold conditions to relatively hot weather and even when there is a fair amount of moisture in the soil the transpiration from the leaves is so great that the plant cannot absorb moisture from the soil sufficiently rapidly to maintain a normal condition and the ears wither and die without producing grain.

Some expansion will occur in these areas but it cannot be appreciable.

No definite compilation has been made of the areas suitable for wheat in Australia. To be accurate exhaustive and costly investigations would be required. Some data is available, however, and the figures submitted hereunder are based on this, the past history of the development of the wheat growing industry and actual observations of the soil variations that occur together with the topography of the country and a knowledge of how the suitability of the soil depends upon climatic conditions.

New South Wales

In New South Wales it is estimated that approximately 20,000,000 acres of land are suitable for wheat production.

For the reasons already outlined it is unlikely that the percentage used each year for wheat growing will exceed 30 per cent. Professor Perkins of South Australia gives figures which indicate 26.33 per cent for that state. It is probable, however, that the percentage in New South Wales may be increased a little as the proportion of fallowed land, owing to climatic conditions, will probably not be so great.

Accepting 30 per cent it may be accepted that New South Wales can sow each year 6,660,000 acres.

In 1915-16 New South Wales actually sowed 5,122,245 acres. In view of this it would appear that the present estimate is conservative. The 1915-16 acreage, however, was abnormal. It was due to an appeal to grow more wheat for war reasons and followed on a year of drought when crops were practically a failure. All land, consequent upon the drought, was in excellent condition for sowing in 1915-16 and as the conditions were exceptionally favourable during that year farmers had no difficulty in sowing extensive areas. Failure the previous year, the anticipation of a good crop and the spur of patriotic enthusiasm led to every available acre being sown. The adopted farming practice was scrapped for the time being and stubble land prepared and sown as well as fallow. This could only occur under exceptional circumstances.

Victoria

Victoria is a comparatively small state and landowners intensively engaged in agriculture at a much earlier period than in New South Wales. In some respects New South Wales agriculture is an off-shoot from Victoria and its development became most active when Victorian farmers began to realise the limitations, in their parent state, brought about by closer settlement increasing the difficulty in obtaining suitable land at a reasonable price.

In 1890 the total acreage under cultivation in Victoria was 2,031,955 acres and in New South Wales 852,704 acres. In 1924-25 the total had increased in Victoria to 4,761,394 acres and in New South Wales to 4,912,124 acres.

It is obvious from this that more effective use has been made of the available agricultural land in Victoria and expansion must be relatively limited.

It is estimated that within the wheat growing area the total acreage is 15,150,000 acres.

Figures are not available showing proportion of this suitable for the production of wheat, but in view of the general character of the country and the history of wheat growing it cannot be anticipated that there will be a very marked increase in acreage.

Some areas which are at present not settled and which are doubtful may ultimately prove productive.

Allowing for some expansion in this direction and full utilisation of land in the existing wheat growing areas, it is estimated that Victoria may ultimately annually sow 5,000,000 acres with wheat.

South Australia

An exhaustive review of the situation in South Australia has been made by Professor Perkins, Director of Agriculture. He accepts an estimate of 15,000,000 acres as being the area suitable for agricultural settlement in that state and considers that of this 3,950,000 acres may be sown annually with wheat for grain after allowing for other forms of agricultural production and land set apart for fallowing, etc.

West Australia

Real agricultural development commenced in West Australia at a much later date than in the other states. In the first year of the present century the production of wheat amounted to only 774,000 bushels, while in 1928-29 the yield was 31,900,000 bushels from 3,163,409 acres.

This state has proved remarkably suitable for wheat growing and will probably eventually become one of the most important in this respect. The acreage under wheat is now almost equal to that of South Australia and not far below that of Victoria.

It is somewhat difficult to make an estimate of the acreage that may ultimately be placed under wheat in West Australia in view of the fact that much land remains to be tested. Investigations are now being made in areas where the rainfall is a little lower than in the existing belt. If these areas are found to be suitable it will add fairly considerably to the wheat area.

As in other states the land in West Australia varies in character and this affects the area that will eventually be sown to wheat.

In view of the soil and weather features it is estimated that ultimately 5,500,000 acres may be sown to wheat annually.

Queensland

It is extremely difficult to make a forecast in regard to the future development of wheat growing in Queensland. Many difficulties are associated with the successful production of the crop and as the land can be profitably used for pastoral purposes the wheat growing industry has not yet been really seriously undertaken.

Queensland's history in regard to agriculture is somewhat similar to that of New South Wales. It is rich pastoral country and the initial trend was in the direction of developing live stock industries instead of agriculture, except in the case of tropical and subtropical products such as sugar and maize.

In those localities where wheat growing is a possibility pastoral industries have been dominant and people have not become skilled in agriculture.

While Queensland has been found to be naturally adapted to grazing it has presented difficulties of considerable magnitude to the wheatgrower. The rainfall is of a summer type and although the winter mean is comparatively high the rainfall in its incidence is very erratic. It varies from year to year and from month to month in any one year. The winters are warm and this combined with a rich soil produces a luxuriant growth when moisture is available, which wilts easily if rain fails in the spring and is subject to attacks of disease if rain is abundant. The transition from winter to summer is rapid and wilting may occur at this time. Bright clear weather is not always experienced at the ripening period and the quality of the grain may suffer.

These are difficulties which have been experienced, but notwithstanding, there are distinct possibilities of wheat growing being successfully established especially in districts west of those where it is now principally grown.

The excellent results which have been obtained when the land has been thoroughly farmed, to conserve moisture, justify the hope that wheat may become a fairly profitable crop, especially in conjunction with the raising of sheep.

In view of the present position, however, no marked development can be expected in the immediate future and probably within a reasonable period it cannot be expected that the acreage sown to wheat will exceed 750,000 acres. As the present acreage is slightly over 215,000 acres this represents a considerable step forward.

Tasmania

This state sows only a small acreage with wheat. No important expansion can be expected as the arable land is closely farmed. Developments in agriculture in this state will probably be in the direction of the production of crops of greater value.

PROBABLE YIELD

The average wheat yield in Australia must always remain comparatively low. Most of the wheat is grown in regions where the rainfall is low and the moisture available is not sufficient to produce a heavy yield.

The growing season is also limited. Owing to temperature and the incidence of the rainfall it cannot be safely sown before April and May and the spring warmth brings it to maturity during October, November or December. The favourable temperatures during the growing period lead to rapid growth and quick-maturing wheat never gives the heavy yields harvested from crops which occupy the land for a long period.

It is noteworthy that the highest average wheat yields are obtained in those countries in which the rainfall is favourable and which have climates that ensure a long growing season. The United Kingdom is a case in point with an average yield of 33.4 bushels per acre. Efficient farming practices are, however, to a considerable extent responsible. Canada also illustrates it with an average of 16 bushels as compared with the United States of America

with 14 bushels. The latter country, owing to its geographical position, has a warmer climate and wheat matures in a shorter period.

In Australia it is found that conditions of a similar kind tend to give higher averages. Victoria is most favoured in regard to rainfall and climatic conditions and holds the highest average for the Commonwealth.

The nature of the soil also tends to restrict the yield. On the whole it is somewhat light and even with favourable rainfalls does not produce large yields. It is noteworthy that the highest average yield ever obtained in New South Wales was 17.8 bushels per acre. This was in 1920-21 when the conditions were exceptionally favourable.

A severe drought prevailed during the preceding year and the land had a long rest. In 1920 favourable rain caused a perfect germination and the conditions for growth were excellent throughout the season. Despite this, however, this average yield cannot be regarded as high.

While the natural conditions render it unlikely that the average yield of Australia will ever be so high as in more temperate countries it can undoubtedly be increased.

Factors apart from natural conditions have tended to keep the average low. In the first instance farmers encountered peculiar soil and climatic conditions and had to devise suitable farming methods.

Varieties adapted to the conditions had also to be selected. The improvement that has been made in yields is indicated by the advances in South Australia. From 1876 to 1906 the average acre yield was less than 5½ bushels per acre. After 1906 an improvement began to appear and for the last decade of 1916-26 the average rose to 12.44 bushels per acre. This cannot be regarded as a maximum as much has yet to be learned in regard to farming methods, greater improvement can be made in varieties and many farmers can improve in efficiency.

In all the states also up to the present new land has been in process of development and the conditions including lack of capital have been adverse to the best yields being secured from the land.

This has operated in all the states and will continue to operate for some time.

The peak in the average yield will not be reached until a few years have passed after all important new land has been brought under wheat.

In estimating what the average yield for each state will be within a reasonable time consideration must be given to the rainfall, the character of the soil, the stage the state has reached in agricultural development, the amount of new land to be opened up and the general efficiency of the farmers.

On this basis it is estimated that the average yield of each state within 20 years should be New South Wales 13.5, Victoria 16.0, South Australia 14.0, West Australia 12.0, Queensland 13, Tasmania 18.5.

	Ultimate Total Acreage	Used for Hay, etc., 8 per cent	Total Area Grain	Average Yield per acre	Total yield bus.
New South Wales	6,600,000	528,000	6,072,000	13.5	81,972,000
Victoria	5,000,000	400,000	4,600,000	16.0	77,480,000
South Australia	4,293,400	343,400	3,950,000	14.0	54,300,000
West Australia	5,500,000	440,000	5,060,000	12.0	60,720,000
Queensland	750,000	60,000	690,000	13.0	8,970,000
Tasmania	25,000	.....	25,000	18.5	462,500
Total	22,168,400	1,771,400	20,397,000		283,904,500

While this is an estimate of the acreage that will probably be ultimately sown each year with wheat in Australia, actual realisation will be achieved only by slow degrees. It will mean the extension of wheat growing into areas yet untouched where the conditions are less favourable than in the existing wheat growing areas. This will call for courage, determination, initiative and efficiency in farm management, together with the closest co-operation between farmers and by the government with farmers.

It will need also the full utilisation of lands in the existing areas and the adoption of most efficient methods in order that lands which are on the margin shall be profitably cultivated. The ability hitherto shown by farmers and the progress that has been made at any rate encourage a belief that the objective will be achieved.

AUSTRALIAN WHEAT EXPORT VALUES

Compiled from official figures issued by the Commonwealth Statistician and Actuary

	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27	1927-28	1928-29
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Price per bus.	5- 9	5- 5	4- 8	6- 8	6- 4	5- 7	5- 6	*5- 0

* Figures for eleven months to 31-5-29.

APPENDIX A—AREA UNDER ALL CROPS 1860 TO 1924-25

Season	New South Wales	Victoria	Queensland	South Australia	West Australia	Tasmania	North. Ter.	Fed. Cap. Ter.	Australia
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1860- 1	260,798	387,282	3,353	359,284	24,705	152,860	.....	....	1,188,282
1870- 1	426,976	692,840	52,210	801,571	54,527	157,410	.....	....	2,185,534
1880- 1	629,180	1,548,809	113,978	2,087,237	57,707	140,788	.....	....	4,577,699
1890- 1	852,704	2,031,955	224,993	2,093,515	69,678	157,376	.....	....	5,430,221
1900- 1	2,445,564	3,114,132	457,397	2,369,680	201,338	224,352	.....	....	8,812,463
1910-11	3,386,017	3,952,070	667,113	2,746,334	855,024	286,920	360	....	11,893,838
1920-21	4,465,143	4,489,503	779,497	3,231,083	1,804,987	297,383	296	1,966	15,069,858
1921-22	4,445,828	4,530,312	804,507	3,378,764	1,901,680	293,708	283	1,942	15,357,024
1922-23	4,694,287	4,862,548	863,755	3,575,452	2,274,998	298,611	427	2,172	16,572,250
1923-24	4,809,591	4,682,144	871,968	3,562,551	2,323,070	279,122	440	2,300	16,531,186
1924-25	4,912,124	4,761,394	1,069,837	3,557,405	2,710,856	263,872	342	2,361	17,278,191

APPENDIX B—WHEAT PRODUCTION IN EACH STATE AND TOTAL PRODUCTION IN AUSTRALIA

Compiled from official figures issued by the Commonwealth Statistician and Actuary

Year	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Fed. Capital Territory	Total Australia
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
1923-24	33,171,300	37,795,704	243,713	34,551,955	18,920,271	305,628	4,700	124,993,271
1924-25	59,752,435	47,364,495	2,779,829	30,528,625	23,887,397	231,388	14,565	164,558,734
1925-26	33,800,619	29,255,534	1,973,477	28,603,101	20,471,177	395,603	4,881	114,504,392
1926-27	47,373,713	46,886,020	379,339	35,558,711	30,021,616	537,000	5,487	160,761,886
1927-28	27,041,100	26,160,814	3,783,584	24,066,012	36,370,219	773,142	4,004	118,198,875
1928-29*	49,798,200	47,000,000	3,000,000	28,070,000	31,906,693	700,000	....	160,474,893

* Final estimate.

APPENDIX C—AREA UNDER WHEAT IN EACH STATE AND IN AUSTRALIA

Compiled from official figures issued by the Commonwealth Statistician and Actuary

Year	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Fed. Capital Territory	Total Australia
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1923-24	2,945,040	2,454,117	51,149	2,418,415	1,656,915	14,503	295	9,540,434
1924-25	3,549,367	2,705,323	189,145	2,499,852	1,867,614	12,954	711	10,824,966
1925-26	2,924,745	2,513,494	165,999	2,465,648	2,112,032	19,091	267	10,201,276
1926-27	3,352,298	2,915,315	57,084	2,768,403	2,571,187	23,194	438	11,687,919
1927-28	3,029,950	3,064,172	215,073	2,941,360	2,998,523	29,448	562	12,279,088
1928-29*	4,072,600	3,800,000	200,000	3,317,500	3,163,409	30,000	....	14,583,509

* Final estimate.

APPENDIX D—AVERAGE YIELD OF WHEAT PER ACRE IN EACH STATE AND IN AUSTRALIA

Compiled from official figures issued by the Commonwealth Statistician and Actuary

Year	N.S.W.	Victoria	Q'land	S. Aus.	W. Aus.	Tasmania	Fed.Capital Territory	Total Australia
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
1923-24	11.26	15.40	4.76	14.29	11.42	21.07	15.93	13.10
1924-25	16.83	17.51	14.70	12.21	12.79	17.86	20.49	15.20
1925-26	11.56	11.64	11.89	11.60	9.69	20.72	18.28	11.22
1926-27	14.13	16.08	6.65	12.84	11.68	23.15	12.53	13.75
1927-28	8.92	8.54	17.59	8.18	12.13	26.25	7.12	9.63
1928-29*	12.23	12.37	15.00	8.46	10.09	23.33	.....	11.00

* Final estimate.